

(12) UK Patent Application (19) GB (11) 2 070 731 A

(21) Application No 8005513

(22) Date of filing  
19 Feb 1980

(43) Application published  
9 Sep 1981

(51) INT CL<sup>3</sup> F16J 1/02  
10/04

(52) Domestic classification  
F2T 1 2 37A11 37E2B

(56) Documents cited  
None

(58) Field of search  
F2T

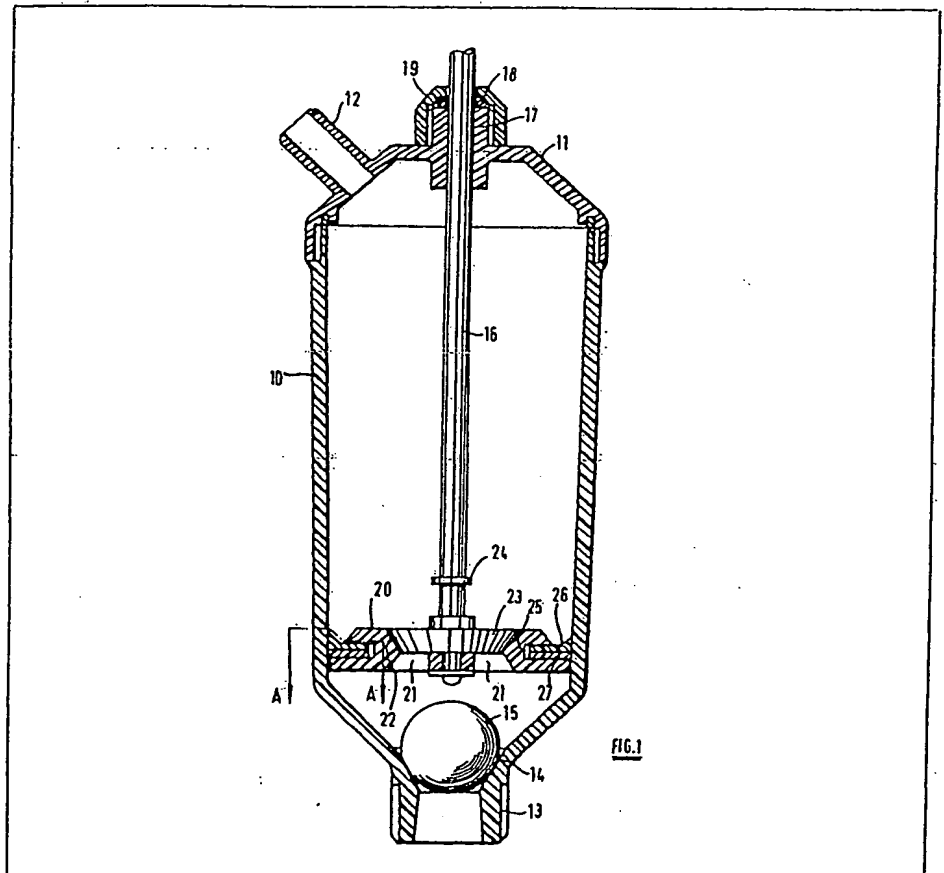
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(54) Beer pump

(57) A liquid delivery pump comprises a cylindrical body (10) moulded from rigid plastics material and having a tapered internal bore, and a piston (20) carrying at least one peripheral split sealing ring which can expand and contract radially to maintain sealing engagement with the wall of the bore throughout the piston stroke. A preferred embodiment includes two sealing rings (26 and 27) in face-to-face contact with the gaps (26a, 27a—Fig. 2) out of register.



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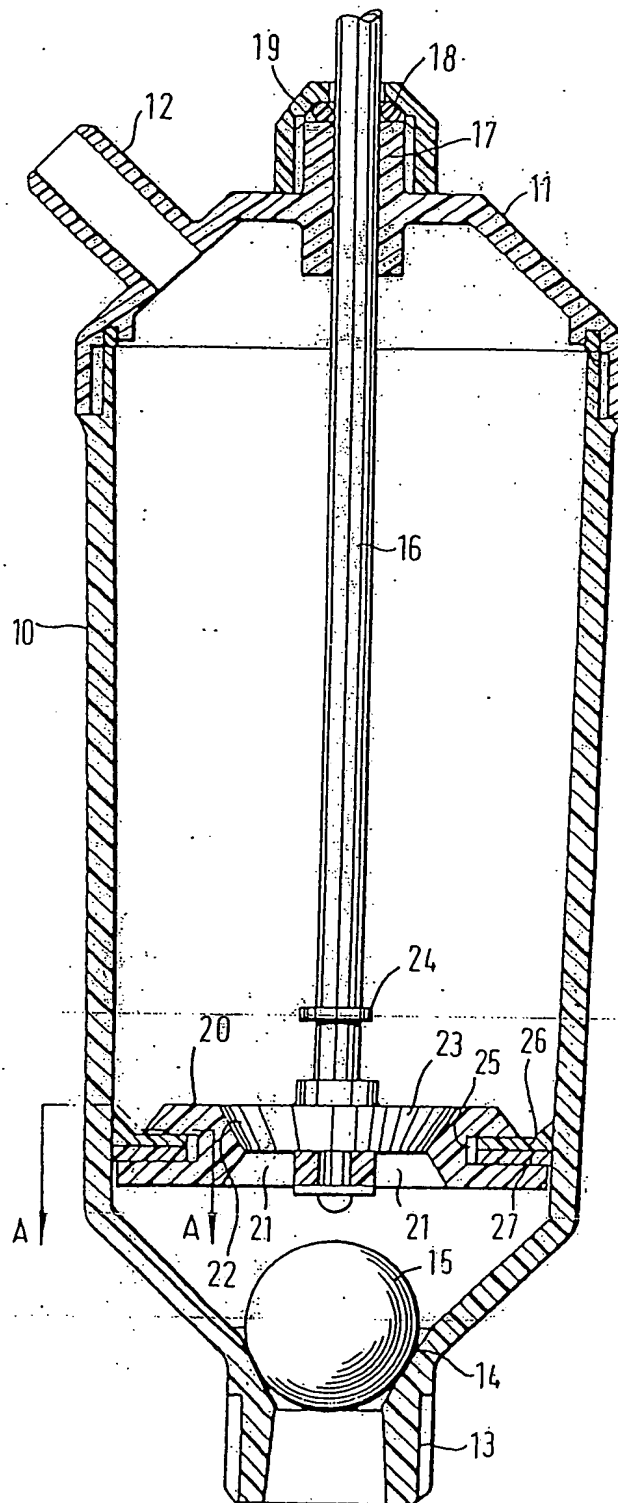
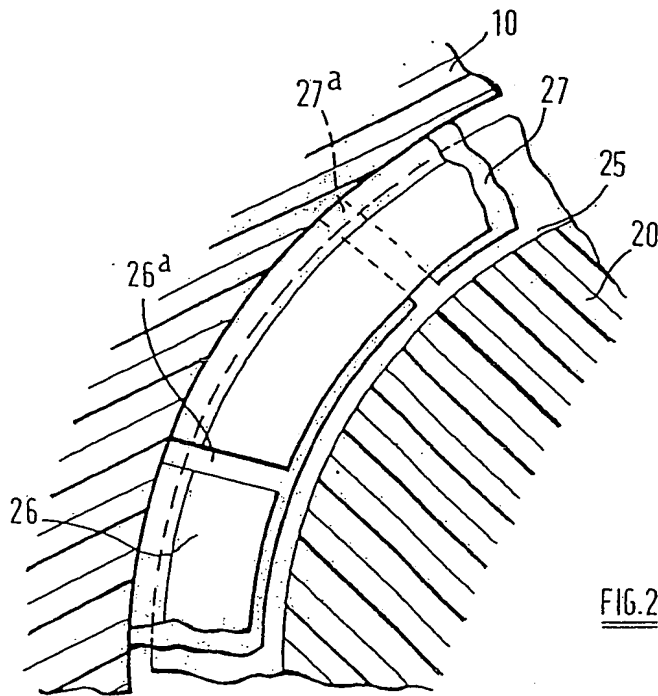


FIG. 1

FIG. 2

## SPECIFICATION

## Pump

- 5 This invention relates to a pump for delivering liquids, and of the kind comprising a piston slidable in a cylinder so as to displace liquid from the cylinder.

- 10 The invention has been developed particularly in connection with a pump for dispensing liquids for human consumption, namely a so-called "beer engine", but it will be understood that the invention is applicable to liquid delivery pumps intended for other purposes also.

Customarily, beer engines have been made principally of suitable metals which are resistant to corrosion, but require careful cleaning internally and externally.

- 20 The use of appropriate plastics materials to replace most of the metal components would have a number of advantages, particularly as regards ease of cleaning and freedom from corrosion. However, for commercial reasons, such components should be made so far as possible as mouldings and in producing the cylindrical body of such a pump it is essential to provide a suitable draft on nominally parallel surfaces for ease of removal from the mould. Accordingly, the internal bore of a cylinder produced in this way cannot readily be made completely uniform throughout the length of the cylinder, but will taper somewhat from end-to-end. This then presents difficulties in ensuring that the piston seals effectively with the cylinder at all points along the length of its stroke.

- The object of the present invention is to provide such a pump with a seal on the piston which remains fully effective throughout the whole stroke.

- Accordingly, the invention resides in a liquid delivery pump comprising a body and a piston slidable therein to displace liquid from the body; wherein the body is formed as a moulding of a rigid plastics material with an internal bore having a draft whereby its diameter varies along the length of the body, and the piston carries a split sealing ring extending around its periphery, the ring being able to expand radially and maintain pressure engagement with the internal wall of the body over the entire operative stroke of the piston despite the draft on said bore.

- 55 In order to minimise leakage of the liquid past the piston due to the gap in the sealing ring, the sealing ring may be so dimensioned that the ends of the ring are substantially in contact with one another at the narrowest part of the bore. In this way, the width of the gap which exists when the piston is at the widest part of the bore will be minimised. The sealing ring may be disposed in a peripheral recess formed in the piston, and the diameter of the piston itself may correspond closely to

the minimum diameter of the bore so that the area of the gap through which liquid can escape when the piston is at the widest part of the bore is limited to the area defined by the radial clearance between the piston and the bore at that point and the width of the gap.

- However, in order to eliminate such leakage entirely, the piston is preferably provided with a further split sealing ring which is arranged with the gap in its periphery out of register with the gap in the periphery of the first ring, the two rings being in face-to-face contact with each other so that at all times each serves to close the gap in the other.

- This construction has the advantage that manufacturing tolerances on the dimensions of the body, the piston, and the rings may be relaxed, so that the pump can be produced more economically.

The invention will now be described by way of example with reference to the accompanying drawings wherein:-

- Figure 1 shows a transverse section through a pump in accordance with the invention in a plane containing its longitudinal axis; and

Figure 2 is a fragmentary section on the line A of Fig. 1 showing the arrangement of rings on the piston to a larger scale.

- 95 The pump shown in the accompanying drawings is of a generally conventional type, comprising a cylindrical body 10 which is closed at its upper end by a cap 11 affording an outlet port 12. The body is formed with an inlet 13 at its lower end which includes a valve seat 14 which is engaged by a stainless steel ball 15. However, instead of the body and cap being formed from metal, they are in this case formed as mouldings of a suitable rigid plastics material such as an acetal resin.

- A stainless steel rod 16 extends through an integral bushing 17 on the cap 11 and sealingly engages an O-ring 18 which is retained by the screw cap 19 which threadedly engages the boss 17.

- The rod 16 carries at its free end, within the body 10, a piston 20 which is formed as a moulding of a suitable synthetic plastics material, such as an acetal resin. The piston is provided with central apertures 21 which communicate with a frusto-conical seating 22 which is normally closed by a stainless steel frusto-conical valve member 23 which is slidable on the rod 16 between the seating 22 and a circlip 24 on the rod.

- The piston 20 is so dimensioned as to be an easy sliding fit within the body 10 at all points along the length of the latter. In the embodiment illustrated, the internal bore of the cylindrical body 10 tapers slightly in diameter from the upper end of the body towards the lower end so as to afford the necessary draft to enable the body to be readily removed from the mould in which it is formed, (for ease of illustration the taper is exaggerated in

Fig. 1) and the piston 20 is so dimensioned as to fit easily within the lower end of the body, as illustrated.

The peripheral face of the piston 20 is formed with a circumferential recess 25 which accommodates two split sealing rings 26 and 27. These rings are formed from a suitable synthetic plastics material, such as nylon, and each is split at one point around its periphery so as to afford a gap 26a or 27a whereby the ring can expand and contract circumferentially, and thereby adjust to the changing diameter of the bore as the valve moves along the length of the cylinder.

The rings are so dimensioned that in the free state they have a diameter somewhat greater than the maximum internal diameter of the bore in the body 10 and are thus placed in a state of compression within the body. The circumferential width of the gaps 25a, 26a is such that the ends of the ring do not come into contact with each other when the ring is compressed to the maximum extent when the piston is at the lower end of the body.

The two rings are so assembled with the piston that, as shown in Fig. 2, the gaps 26a and 27a are not in register with one another, and the two rings are maintained in face-to-face contact within the recess 25 so that each ring, at all times, effectively closes the gap in the other ring against direct passage of liquid through the gap between opposite faces of the piston. In Fig. 2, the two gaps are shown relatively close together, but it will be understood that in practice they should be arranged as far apart as possible, preferably at diametrically opposite positions. Leakage of liquid past the piston can only occur then by flow of fluid along the long and very constricted passage defined by the length of the gap 26a in the upper ring, the length of the passage defined with the recess 25 internally of the rings, and the length of the gap 27a in the lower ring.

The maximum cross-sectional dimension of such passage can readily be restricted to the order of one square millimetre, and its length may be of the order of 10 centimetres so that it offers very substantial resistance to the flow of liquid and losses are vanishingly small.

In the illustrated embodiment, the pump operates in conventional manner. On the upstroke, liquid above the piston 20 is lifted and expelled through the port 12, whilst the member 23 is held firmly against its seating 22, and at the same time the ball 15 is lifted off its seating to allow further liquid to be drawn into the body beneath the piston. On the downstroke, the ball 15 is forced onto its seating 14 and the member 23 lifts off its seating 22 so as to allow liquid to be transferred from the space below the piston 20 to the space above it. However, in accordance with the invention, as the piston moves up and down the bore in the body 10, the rings

26 and 27 expand and contract with the changing diameter of the bore so as to be maintained in firm pressure engagement therewith and maintain an effective seal around the periphery of the piston at all times.

Whilst, in the illustrated embodiment, the draft provided on the bore in the body takes the form of a uniform taper from top to bottom of the body, it will be appreciated that the sealing rings would function equally well if the bore tapers from both ends towards a minimum diameter at the mid-point (the body 10 for example being provided with a separate bottom end cap).

Whilst the piston 20 preferably carries two split sealing rings 26 and 27 as illustrated, it is contemplated that under some circumstances it may be possible to utilise only a single split sealing ring providing the body, piston and ring can be made to close tolerances so that the width of the gap in the ring, when in use, is closely controlled and maintained to the smallest practicable value. However, by utilising two, staggered split rings, the pump can be manufactured much more easily with wider tolerances, and all the attendant commercial advantages that that implies.

## 95 CLAIMS

1. A liquid delivery pump comprising a body and a piston slidable therein to displace liquid from the body, wherein the body is formed as a moulding of a rigid plastics material with an internal bore having a draft whereby its diameter varies along the length of the body, and the piston carries a split sealing ring extending around its periphery, the ring being able to expand radially and maintain pressure engagement with the internal wall of the body over the entire operative stroke of the piston despite the draft on said bore.

2. A pump according to Claim 1 wherein the sealing ring is so dimensioned that the ends of the ring are substantially in contact with one another at the narrowest part of the bore.

3. A pump according to Claim 1 or Claim 2 wherein the sealing ring is disposed in a peripheral recess formed in the piston, and the diameter of the piston itself corresponds closely to the minimum diameter of the bore.

4. A pump according to any one of the preceding claims wherein the piston is provided with a further split sealing ring which is arranged with the gap in its periphery out of register with the gap in the periphery of the first ring.

5. A pump according to Claim 4 wherein the two sealing rings are in face-to-face contact with each other so that at all times each serves to close the gap in the other.

6. A liquid delivery pump substantially as hereinbefore described with reference to and

as shown in the accompanying drawings.

Printed for Her Majesty's Stationery Office  
by Burgess & Son (Abingdon) Ltd. 1981.  
Published at The Patent Office, 25 Southampton Buildings,  
London, WC2A 1AY, from which copies may be obtained.